This invention relates to a sizing for the treating of textile yarn which may be made of cotton, rayon, wool or other fibers particularly for treating warp threads, prior to weaving them in a loom into a fabric. The sizing of the yarns is for the purpose of strengthening them, controlling their elasticity, and smoothing them for better operation in the loom or other machinery, also to improve the appearance of the fabric formed by giving to it an even or uniform appearance when finished. The process is a foundation operation and one which is exceedingly important inasmuch as faulty sizing may cause tremendous losses in the later production of the mill.

Yarn, as is known, consists of short fibers which are held together by twisting and when breakage occurs although there is a breakage of some of the individual fibers there is also a slippage of other of the individual fibers one past the other. The size serves to cement the individual fibers together so that they cannot readily slip one by the other and thus materially strengthens the yarn, in fact, the sized yarn acts more nearly as if it were a single solid fiber. There is also a protective film placed about the fibers which in itself has some strength, although primarily this provides that rubbing of the yarns one past the other will not effectively wear or disturb the fibers but rather will afford a longer life than were no such protective coating present, and this latter function is especially important. Where the yarn passes through the reciprocating reed and the eyes of the reciprocating heads which are continually in motion and cause a relative rubbing motion of these parts along the yarn.

The act of sizing yarns is old and well-known and the size material used has for a considerable time consisted largely of starches, various kinds of starches being utilized depending upon the particular results desired. The starch was usually mixed with water and through fermentation of the starch and the arresting of this action such as by boiling, it was placed in a state so that the size would adhere to the yarn.

Although starches previously formed the base, and do today of most sizings, there are certain additive products which assist the sizing and give better results upon most textile fibers. These different additive products consist of softeners comprising oils and fats and the like, dextrine, gums, moisture carriers, and other chemicals each for a certain particular purpose. These additive products may be purchased on the market separately and mixed with the starch size when the slashing process is to be performed, but they are supplied largely as size compounds already mixed together in the proper proportions to be added as a compound to the starch base of the size.

Hitherto, the softener or the size compound, such as is usually supplied on the market, had a liquid, semi-liquid or pasty physical form requiring the use of some liquid tight container for handling the same and a relatively expensive container for shipment of the same. A part of the compound which was furnished for sizing was water which increased the shipping weight and made shipping and handling somewhat more expensive, particularly as compared with the present invention. Further, when the softener alone or the compound existed in this liquid, semi-liquid or pasty state loss of moisture would often occur due to exposure to the atmosphere and if any chemicals were included in the compound which were unstable a change in these chemicals would occur.

This invention has for its primary object to provide a sizing softener or a sizing compound in a dry or powdered physical state so that it may be more conveniently transported in inexpensive barrels or containers and in this form also may be more conveniently handled in the preparation of the sizing.

Another object of the invention being a material having greater stability and one which will not lose moisture when exposed to the air or be likely to change its chemical state by reason of such loss of moisture. A further object of the invention is the production of a better size when on the yarn and one which will have a finer body and be of a better lubricating value than sizing having liquid, semi-liquid or pasty softener as a part thereof.

The softener which is used in a starch base sizing is a fat which may be readily dispersed for use in the sizing solutions. It serves to compact the sizing and prevent it from powdering and dusting off of the yarn when in use, also it imparts suppleness and smoothness to the yarn treated. This softener is sometimes added before the boiling of the starch base but more often added after the starch base has been brought to a boil.

We replace the liquid, semi-liquid or pasty form of softener by materials of a fatty or waxy nature in a solid physical state usually in a more or less finely divided or comminuted form which may
be obtained by pulverizing or crystallizing, or in the "beaded" or flaked form which consists of particles which may be obtained by various methods in a manner well known in the trade. We utilize for this purpose hydrogenated, chlorinated or polymerized fats or waxes, which, without this treatment, would be liquid, semi-liquid or pasty, but by which these fats or waxes are rendered solid. This hydrogenation, chlorination or polymerization may be brought about by various processes well known in the art.

Glycerides which are treated in the above manner, such as by hydrogenation, are one form of fats rendered solid which may be used in place of the liquid, semi-liquid or pasty form of softeners which have previously been used for sizing purposes. Other forms of the softeners may be used are fatty acids in a solid physical state, as above described, which may have been treated in the above manner, such as by hydrogenation, chlorination or polymerization. Also, we may use fatty acids derived from the glycerides of the character just mentioned or fatty esters in a solid state formed from these fatty acids or solid amid derivatives, such as stearamide. Also, we may use natural fats which may be powdered by crystallization, distillation or pressing and may be produced in the solid forms above mentioned. Also, we may use waxes which may or may not have been hydrogenated, such as paraffin or petroleum, the latter being an artificial product which may be ground, and we may use other solid products or material derived from petroleum compounds by hydrogenation, chlorination or polymerization. Hydrogenated, chlorinated or polymerized mineral oils may be used. Also, fatty acids of a high molecular weight, which although at present prices are too expensive for commercial use for our purpose, are representative of a type of product which may be utilized for this purpose. Stearal alcohol produced from glycerides or fatty acids by hydrogenation is an example. Whether the above material named be natural or synthetic is immaterial. These chemically different fats may be supplied either as a mixture of the various ones, such as a mixture of the different glycerides and fatty acids or as each alone, such as glycerides alone or fatty acids alone, all being supplied in a solid state in temperatures up to 120° F. all finely divided to be in the convenient form as above stated. By reason of this different physical form at room and shipping temperatures a material is provided which may be more easily and inexpensively handled and one which will not change when exposed to the air.

The softener in the above powdered or finely divided form when supplied alone for introduction into a basic starch sizing will be utilized in an amount to furnish substantially the same equivalent amount of softener that has previously been used in the size, or because of the better lubricant value of the solid fat a smaller quantity of the solid fat may be used than where the liquid, semi-liquid or pasty fat was heretofore used.

The size compound which is added to the basic starch size in order to provide certain additive qualities and properties to the size can also now by the use of our new physical form of softener be supplied in a powdered or dry form as distinguished from the liquid, semi-liquid or pasty form which has heretofore been on the market. This dry size compound will consist of the following ingredients:

1. A softener........................................5 to 95
2. A hydroscopic conditioning material..........................1 to 10
3. Anti-foaming material......................................1 to 10
4. A binder..................................................2 to 95

The softener or fatty ingredient of the compound is present for addition to the size to function the same as above mentioned in connection with the purpose of the softener added to the basic starch size alone. The same products above enumerated will be used.

The hydroscopic conditioning material serves to absorb moisture from the atmosphere and transmit it to the yarn to maintain the yarns in a proper moist state so that the maximum strength properties of the yarn may be had. Examples of materials used for this purpose are urea, calcium chloride, zinc chloride or magnesium chloride. This material under some conditions might be omitted.

The anti-foaming material is present so that as the size is worked it will not froth up and spill over on the floor or be in such a condition that the yarn passes through the froth rather than sizing liquid. Examples of materials used for this purpose are alum compound, aluminum sulphate, aluminum formate, or oxalic acid. This material under some conditions might be omitted.

The binding material tends to cause the fibers of the yarn as sized to lay flat and not mat down to the yarn rather than extending out from the yarn. This binding material may also be present in a sufficient amount to also act as an extender or a diluent of the sizing compound where desired. The materials used for this purpose, are locust bean gum, carob bean gum, gum karaya, gum tragacanth, casein, dextrine or dextrinized products, which would serve chiefly as the binders, while starches, flours, converted or modified starches and dextrine would serve as expanders. These latter act more or less as diluents of the compound and afford more easy handling.

The final size used for different yarns varies largely with different conditions which are encountered. If the yarn appears to be too dry it indicates that there is not enough of the hydroscopic material in the size and should be supplied in a powdered or dry form as distinguished from the liquid, semi-liquid or pasty form which has heretofore been used. The anti-foaming material is also a material which will be changed depending upon conditions encountered where the size is used. If too much foaming is existent because of the mechanical processes of applying the size, such as frothing at the top, more anti-foaming material will be present and this may be changed throughout a range of from 1% to 10% of the size compound.

The binding material which is present in the size compound may exist in a quantity sufficient to serve as a binder or to hold down the threads and also as a diluent, and as a whole may exist anywhere from 2% to 95% of the size compound. At or approximating the upper limit of the range here given the size is complete except for water and will not be mixed with starch or other materials. In this case water only will be added to produce a size compound which may be placed in the slasher trough.

The compound, although usually furnished in a...
divided state, may be pressed into the form of bricks the parts of which will adhere together due to the presence of some of the materials which may be selected for incorporation in the sizing compound.

The use of this solid finely divided softener furnishes a better sizing on the yarn. It is found that the size itself on the yarn is of a finer texture and that it has better lubricating value than the same lubricating value is present on the yarn with a smaller equivalent weight of fat present due to its solid and more substantial form, and accordingly the sized product is superior.

The foregoing description is directed toward one illustrative embodiment of our invention and the means for carrying the same into operation, but it will be readily understood that although specific terms may be employed these are used in a generic and descriptive sense and not for the purpose of limitation, all equivalents of the ingredients present being within the purview of the invention as defined and limited only by the terms of the appended claims.

We claim:

1. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and starch.

2. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

3. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising a soluble hygroscopic material in granular form consisting of urea; and an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

4. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; and an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

5. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising urea; and an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

6. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; and a soluble hygroscopic material in granular form consisting of calcium chloride, zinc chloride, and magnesium chloride; and an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

7. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; and a soluble hygroscopic material in granular form consisting of the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines.

8. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines; and an anti-foaming material consisting of a metal salt selected from the group consisting of alum, aluminum sulphate, and aluminum formate.

9. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising urea in granular form; an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines; and an anti-foaming material consisting of a metal salt selected from the group consisting of alum, aluminum sulphate, and aluminum formate.

10. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; urea in granular form; an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines; and an anti-foaming material consisting of a metal salt selected from the group consisting of alum, aluminum sulphate, and aluminum formate.

11. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; urea in granular form; an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines; and an anti-foaming material consisting of a metal salt selected from the group consisting of alum, aluminum sulphate, and aluminum formate.

12. A yarn sizing assistant in a finely-divided solid state comprising a hydrogenated fat of a material selected from the group consisting of higher fatty acids of over 10 carbon atoms and their glycerides; and comprising starch; and a soluble hygroscopic material in granular form selected from the group consisting of calcium chloride, zinc chloride and magnesium chloride; an organic binding material of substantially the character of a gum selected from the group consisting of carob bean gum, gum karaya, gum tragacanth and dextrines; and an anti-foaming material consisting of a metal salt selected from the group consisting of alum, aluminum sulphate, and aluminum formate.
tragacanth, and dextrines; and an anti-foam-
ing material consisting of a metal salt selected
from the group consisting of alum, aluminum
sulphate, and aluminum formate.
13. Textile threads, yarns and the like sized
with a sizing compound of the composition
claimed in claim 2.
14. Textile threads, yarns and the like sized
with a sizing compound of the composition
claimed in claim 6.
15. Textile threads, yarns and the like sized
with a sizing compound of the composition
claimed in claim 7.

FREDERICK W. MAYER.
ELIOTT D. COLE.